



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/706,276	11/13/2003	Koji Ando	031267	5648

23850 7590 04/13/2007
ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP
1725 K STREET, NW
SUITE 1000
WASHINGTON, DC 20006

EXAMINER

WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
----------	--------------

1742

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/706,276

Applicant(s)

ANDO ET AL.

Examiner

Harry D. Wilkins, III

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4 and 9-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4 and 9-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to:
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status

1. The rejection grounds based on Duggan in view of Atwood et al, Gandon et al and Cain have been withdrawn in view of Applicant's amendment to claim 1 incorporating limitations from previous versions of claims 5-7. However, the rejection grounds of previous versions of claims 5-7, incorporating Baczek et al are made below.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 4 and 9-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duggan (GB 2,122,592) in view of Atwood et al (US 3,785,944), Gandon et al (US 3,998,628), Baczek et al (US 4,256,553) and Cain (US 1,980,381).

Duggan teaches (see abstract and pages 1-2) a process for the extraction of metal values including (3) a solvent extraction step for a cuprous chloride/ferrous

Art Unit: 1742

chloride solution using a water immiscible organic solvent and a step of stripping the copper from the organic solvent to produce a stripping product liquor containing the cuprous ion and an aqueous solution containing the ferrous ion. The liquor containing the cuprous ion was subjected to electrowinning to produce electrolytic copper and spent electrolyte.

Duggan teaches (see page 1, lines 34-55) that the cuprous-ferrous chloride solution was produced by leaching of complex sulphide ores using ferric chloride and or cupric chloride, but did not give details of the leaching method.

Atwood et al teach (see abstract, figure 2 and col. 3, line 51 to col. 4, line 15) teach a process of treating chalcopyrite ore (CuFeS_2) to create a cuprous-ferrous chloride solution by (1) a chloride-aided leaching step ("OXIDATION STAGE") for leaching the copper material (chalcopyrite) in the presence of chlorine in an acidic, aqueous chloride solution to produce a leaching product liquor containing copper ion and a residue containing elemental sulfur and (2) a copper ion reduction step ("REDUCING STAGE") for reducing the leaching product liquor in the presence of a chalcopyrite reductant to produce a reduction product liquor containing cuprous ions. It should be noted that Atwood et al teach feeding partially reacted chalcopyrite to the leaching step (using the partially reacted solids from the "REDUCING STAGE"). However, as noted by Applicant's own claim 9, such use of partially reacted copper source material was within the scope of claim 1.

Therefore, it would have been obvious to one of ordinary skill in the art to have made the cuprous/ferrous chloride solution to be separated by the method of Duggan by

Art Unit: 1742

the process of Atwood et al because the process of Atwood et al was able to readily form the desired solution without producing undesired or environmentally harmful by-products such as sulfuric acid.

However, Atwood et al do not teach specifically that the leaching step occurs with chlorine gas continually blown into the slurry and does not teach or suggest maintaining the oxidation reduction potential within the claimed range.

Gandon et al teach (see abstract, col. 3, lines 5-26 and 40-53 and col. 4, lines 10-15) teach a similar process of treating iron and copper sulphide containing ores, such as chalcopyrite (CuFeS_2), to create a copper-iron chloride solution. The process includes grinding the ore and adding the powdered ore to water to form a slurry and blowing chlorine gas into the slurry to effect the reaction. Gandon et al further teach (see Examples) using slurry concentrations in the range of 205-380 g/L, leaching temperatures of (see col. 3, lines 17-22) 90-105°C, and an oxidation reduction potential in the range of (see col. 3, lines 12-16) 450-650 mV. Gandon et al teach (see abstract) that the specific treatment conditions disclosed permitted excellent separation of the metal from the sulfur and also permitted preferential extraction of copper over iron.

Therefore, it would have been obvious to one of ordinary skill in the art to have conducted the leaching step ("OXIDATION STAGE") of Atwood et al at the specific conditions disclosed by Gandon et al in order to achieve the advantages disclosed by Gandon et al, namely, excellent separation of the metal from the sulfur and also preferential extraction of copper over iron.

Atwood et al fail to teach control of the size of the chalcopryrite particle size.

Although Gandon et al teach maintaining ore particle sizes below 100 microns, there is no suggestion that the size was known to be result effective.

However, Baczek et al teach (see col. 4, lines 27-35) that the size of the milled chalcopryrite particles was a known result effective variable in a copper ore chemical processes that effected the rate of reaction and the extent of reaction.

Therefore, it would have been with the ability of one of ordinary skill in the art to have optimized the size of the chalcopryrite particle diameter in order to have optimized the rate and completion of the reaction of Atwood et al.

Since Baczek et al teach that the particle diameter affected the reaction rate and completion, it would have been obvious to one of ordinary skill in the art to have determined the requisite temperature required for completion of the reaction.

With respect to the limitation that the temperature of the reducing step occurred at at least the temperature level A given by formula 1, temperature was a known result effective variable with respect to rate of reaction, and, thus, it would have been obvious to one of ordinary skill in the art to have optimized the temperature at which the reducing step occurred.

With respect to the limitation that the oxidation-reduction potential in the copper ion reducing step was 0 to 400 mV, Atwood et al teach (see figure 2) complete reduction of copper ions to the cuprous (+1) state. Thus, one of ordinary skill in the art would have considered the reduction step to inherently have an oxidation-reduction

Art Unit: 1742

potential within the claimed range because it was fully capable of reducing all the copper ions to the +1 state while avoiding precipitation of copper or iron.

The combination of Duggan and Atwood et al do not teach a step of iron electrowinning of the aqueous solution containing the ferrous ion.

However, Cain teaches the concept of (5) producing electrolytic iron by electrowinning a ferrous chloride solution.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed electrowinning of the aqueous solution containing the ferrous ion as taught by Cain in order to also create pure iron from the chalcopryite ore of Atwood et al. Since the chalcopryite ore contained iron, then without the iron electrowinning step, iron would have continued to build-up within the process solution and caused problems when the solution became saturated with ferrous/ferric ions.

Regarding claim 4, based on the values in figure 2 of Atwood et al, the concentration of chloride ion was controlled to 345 g/L.

Regarding claim 9, Atwood et al suggest (see figures 1 and 2) recycling the residue from the reduction stage to the oxidation stage.

Regarding claims 10 and 11, the solvent extraction step of Duggan utilized an organic solvent. The solvent was considered to be 100% of the volume.

Regarding claim 12, it would have been obvious to one of ordinary skill in the art to have optimized the concentration of the stripping solution of Duggan in order to optimize the concentration of the solution for copper electrowinning.

Regarding claim 13, it would have been obvious to one of ordinary skill in the art to have found the optimum temperature at which to have operated the stripping process of Duggan to have optimized the efficiency of the stripping to ensure enough copper was extracted from the organic solvent.

Regarding claim 14, Duggan teaches (see page 2, lines 24-40) using a divided electrowinning cell with the stripping product liquor being fed to the cathode chamber and a ferrous chloride solution being fed to the anolyte chamber. It would have been obvious to one of ordinary skill in the art to have fed the spent catholyte (containing ferrous chloride) from the iron electrowinning cell to the anode chamber of the copper electrowinning cell in order to have regenerated the ferric chloride solution to be returned to the first oxidation stage.

Regarding claim 15, it would have been within the ability of one of ordinary skill in the art to have selected an optimum diaphragm for the divided electrowinning cell.

Regarding claim 16, since the anolyte contained iron ions and dissolved chlorine, it would have been obvious to one of ordinary skill in the art to have increased the pressure on the catholyte side of the diaphragm in order to have prevented anolyte from flowing into the catholyte. One of ordinary skill in the art was aware that increasing the hydraulic head, such as by increasing the height of the liquid, was a manner in which adjacent liquids could be adapted to have different pressures.

Regarding claim 17, it would have been obvious to one of ordinary skill in the art to have recycled the spent copper electrowinning catholyte to be the aqueous stripping solution and the spent copper electrowinning anolyte (previously the spent iron

Art Unit: 1742

electrowinning catholyte) to be the chloride leaching solution in order to reduce waste in the process.

Regarding claim 18, Cain teaches electrowinning of iron in a divided electrolysis cell. It would have been obvious to one of ordinary skill in the art to have optimized the flow rates of anolyte and catholyte in order to have achieved optimum current density and voltage profiles.

Regarding claims 19 and 20, Cain teaches (see figure and paragraph spanning pages 3 and 4) preliminary sulfidation treatment of the electrolyte.

Regarding 21, it would have been obvious to one of ordinary skill in the art to have conducted appropriate processing of the sludge produced by the leaching process in order to provide adequate recovery of expensive precious metals. Such process are well known in the art of metal ore processing.

5. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Duggan (GB 2,122,592) and Atwood et al (US 3,785,944), Gandon et al (US 3,998,628), Baczek et al (US 4,256,553) and Cain (US 1,980,381) as applied to claim 1 above, and further in view of Subramanian et al (US 4,229,270).

Duggan and Atwood et al fail to teach a second electrorefining step producing silver slime.

However, Subramanian et al teach (see col. 1, lines 10-42) using impure copper deposits (such as those formed by the copper electrowinning process of Duggan), as anodes in an electrorefining cell to produce pure copper and recoverable silver slime.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed a second electrowinning step, i.e.-electrorefining, in order to fore a pure copper product and to recover any silver or other metal impurities.

Response to Arguments

6. Applicant's arguments filed 22 February 2007 have been fully considered but they are not persuasive. Applicant has argued that the combination of references does not teach:

- a. Using raw copper containing ore as the reductant.

In response, it is clear from figure 2 of Atwood et al that raw copper material (chalcopryite) is used as the reductant which reduces the copper ions present in the leachant solution.

- b. Using an oxidation-reduction potential of 0-400 mV in the copper ion reduction step.

In response, since the reduction stage of Atwood et al produces substantially complete reduction of copper ions to the +1 (cuprous) state, without production of precipitates, one of ordinary skill in the art would have considered the reduction stage of Atwood et al to inherently occur at an oxidation-reduction potential within the claimed range.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1742

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Harry D Wilkins, III
Primary Examiner
Art Unit 1742

hdw